

Brief Report

According to national and European provisions as well as ICAO agreements, children up to an age of 2 years may be transported jointly with an adult in the same aircraft seat. During the take-off and landing and in dangerous situations, infants shall be restrained with a LOOP BELT or another suitable system. The LOOP BELT is presently approved for aircraft. Child restraint systems (CRS) used e.g. in motor cars all over the world, are not approved for aircraft.

The European ECE-R 44 Regulation specifies the certification criteria for CRS in motor vehicles. They require, among other tests, overturning and dynamic tests. The loads measured with child test dummies shall fall short of particular tolerances. Criteria for new-born test dummies are specified as well.

Similar to the requirements of the ECE Regulation, the FMVSS-213 defines certification criteria for CRS in the USA. The FMVSS defines that such certification criteria are also applicable for CRS used in aircraft. A Technical Standard Order (TSO), which enabled CRS aircraft approval, was however withdrawn by the FAA, since the FMVSS does not take the aviation-specific marginal conditions sufficiently into account.

The comparison between the ECE-R 44, the FMVSS 213 and the SAE AS8049, providing the basis for aircraft seat approvals, demonstrates the differences e.g. in view of the dynamic tests, but also in view of the tolerances specified in these regulations which are determined with test dummies.

The biomechanical aspect of child development demonstrates that in particular at the age of 0 to 2 years, this development is astonishing, from a helpless baby to a toddler capable of walking without assistance. The comparison between the infant and the adult demonstrates that it is not possible to transfer the protection criteria for adults to infants, and for this reason it is necessary to find adequate protection criteria for children.

CRS are generally attached to aircraft seats with the available pelvic belts. CRS include those systems which guide the pelvic belt over the seat platform and such systems where the pelvic belt is led under the seat platform, along a frame.

A total of 19 individual dynamic tests were implemented with CRS, thus examining the impact of the belt anchorage point position as well as the handling of lateral push button release buckles. The test determinants included the positioning and attachment of CRS to the aircraft passenger seat, dynamic behavior and occupant protection.

Requirements for certification criteria were derived from the tests, encompassing protection criteria for infants, CRS classifications, data about CRS dimensions, proposals for the CRS testing and instructions for specifications. Furthermore, recommendations are given for handling the CRS during the take-off, flight and landing phase as well as in an emergency evacuation.